on $\forall n \in \mathbb{N}^*$

$$0 \leq I_n \leq \frac{1}{n+1}$$

$\frac{1}{n+1} \to 0$

on $\lim_{n \to +\infty} \frac{1}{n+1} = 0$

donc $\boxed{\lim_{n \to +\infty} I_n = 0}$